SMITHSONIAN DEPOSIT

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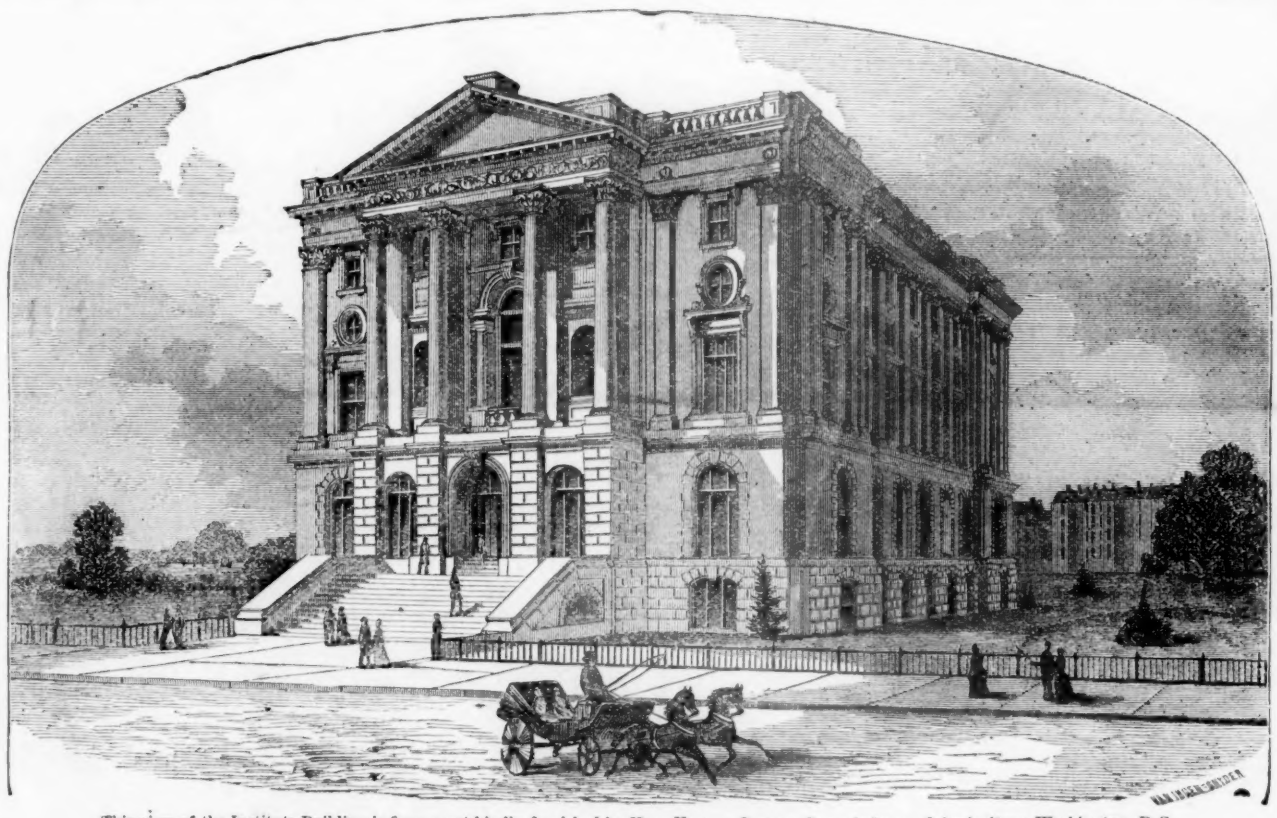


This view of the Institute Building is from a cut kindly furnished by Hon. Horace Capron, Commissioner of Agriculture, Washington, D.C.

The Massachusetts Institute of Technology.

Believing that most of our readers cannot but be gratified thereby, we have availed ourselves of an opportunity to present some fine cuts in this issue, illustrating a department of what is now one of the comdletest institutions in the world for the training of young men to practical scientific pursuits.

The Massachusetts Institute of Technology is presided over—since the death of its first President, Prof. William B. Rogers—by the distinguished mathematician and astronomer John D. Runkle. Upon its list of Professors are also found such names as Sterry Hunt, E. C. Pickering and John M. Ordway. Prof. Hunt's department is that of Geology and Mining Engineering, intimately connected with that which we illustrate here—namely the Mining and Metallurgical Laboratories. The latter are, however, under the special charge of Prof. R. H. Richards.

From the Ninth Annual Catalogue, for 1873–74, we quote the following explanatory details:

"These Laboratories are intended to furnish to the tudent in Mining and Metallurgy the means for studying experimentally the various processes of ore-dressing and smelting, and ores of different kinds may be here subjected to the same modes of treatment as have been adopted at the best mining and metallurgical establishments. The mining laboratory contains an upright tubular boiler, a fifteen horse-power engine, a five-stamp battery of the form in use in Colorado and on the Pacific coast, an amalgamating pan, settler, and concentrator of the kind used in the Washoe process in California and Nevada, for the treatment of silver and gold ores, a Blake crusher, a Whelpley and Storer pulverizer, an edge stone mi l, a Rittinger automatic shaking-table, a hand-jigger, a Freiberg shaking-table, a Sturtevant pressure-blower, and a Batchelder's dynamometer. The metallurgical laboratory contains blast and reverberatory smelting furnaces, a roasting furnace, a furnace for cupellation, furnaces for fusion, and crucible and muffle assay furnaces.

"The experimental work of the laboratory is carried on by the students under the immediate supervision of an instructor. A sufficiently large quantity of ore is assigned to each student, who first examines it for its constituent minerals, samples it, and determines its character and value by analyses and assays, and makes such other preliminary examinations as serve to indicate the proper method of treatment. He then treats the given quantity, makes a careful examination of the products at each step of the process, ascertains the amount of power, water, chemicals, fuel, and labor expended, and thus learns approximately the effectiveness and economy of the method adopted.

"The Institute is from time to time receiving ores of gold, silver, lead, copper, antimony, zinc, iron, etc., from various localities on this continent. These ores are worked, and reports sent to those who contributed them."

From the Report of President Runkle, for the year 1873, we extract also some paragraphs contributed by Prof. Richards, describing the improved modes of teaching, with the aid of this complete working apparatus, that have been arrived at by experience:

"New machines and furnaces will be from time to time added as occasion requires.

"The metallurgical laboratory contains (*a*) a cupelling furnace, arranged upon the German plan, capable of cupelling fifty pounds of lead at a time; (*b*), a blast furnace capable of smelting 500 pounds of copper ore in a day of ten hours, having a cross section of twelve by eighteen inches, and one tuyere in the rear; (*c*), (*d*), roasting and smelting reverberatory furnaces; (*l*, *l*, *l*), a forge, anvil, and bellows; (*f*, *g*, *h*, *i*), crucible and muffle assay furnaces; (*k*) a large kettle, which may be used for smelting lead (Parkes' process), or as a large sand bath for chemical purpo-

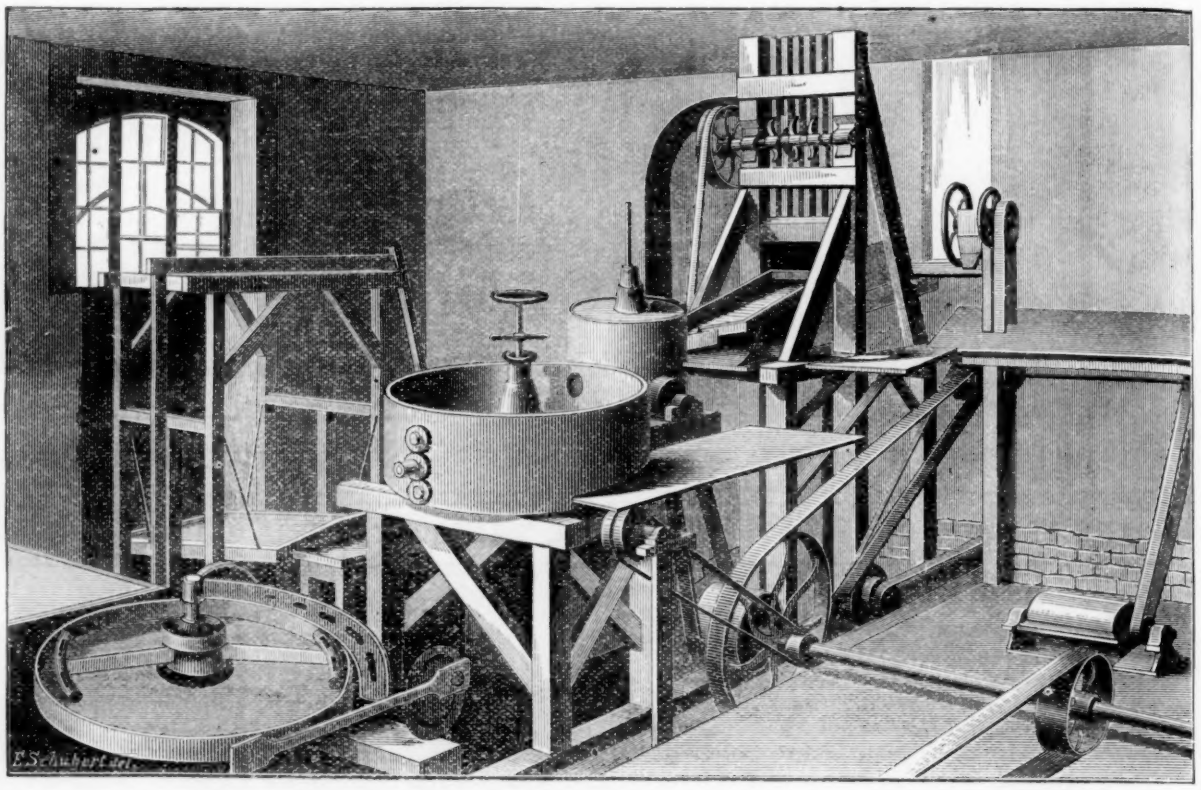
ses. The coal bins are placed under the large mortar.

"The experimental work of this laboratory is carried on by the students under the immediate supervision of the professor. When a class of students begins work in the laboratory, each is assigned a sufficient quantity of ore to work upon. He first determines the minerals contained in the ore, samples it, ascertains its value and character by analyses and assays, and makes such other preliminary examinations as may serve to indicate in a general way the proper method of treatment; and then goes to work on the given quantity, twenty to five hundred pounds, according to the subject, making assays at every step, to ascertain where the loss takes place, and the amount of loss. He also takes account of the amount of power, water, fuel, labor, and chemicals expended, so far as it is practicable to do so.

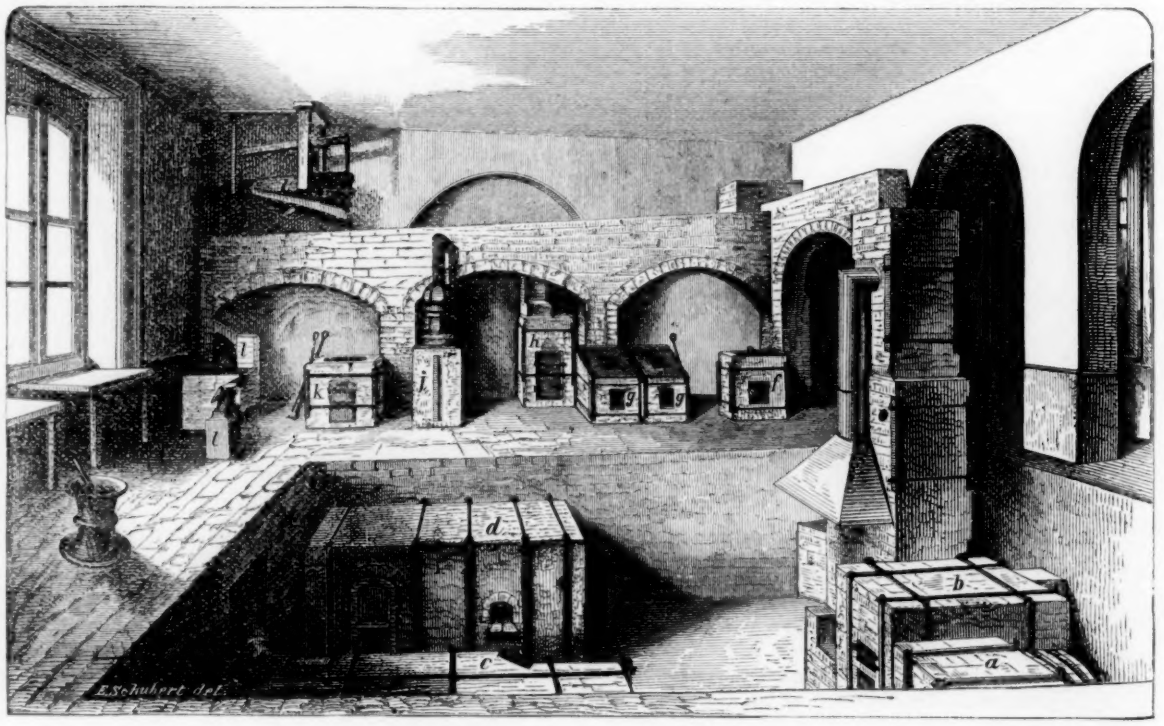
* * * * * *

"The following plan has been arranged for the coming year? A student will receive an ore, examine and prepare it, but at the time when any machine or furnace work is to be done, he will have assistance from his own class, the work to be divided among the assistants, each attending to his assigned part, while the leader exercises a general supervision. At the end of the day each one must hand in a full and carefully written account of his work to the leader, who in turn prepares from these daily statements his final report for presentation to the professor.

"By and by another student in turn becomes leader of a party, receiving a new ore to investigate, and so on until each one of the class has learned the duties of workman and superintendent, and the prescribed metallurgical course is ended. It is believed that in thus throwing the whole responsibility of a few simple things on each student, the work will be more thoroughly done, and the reports will be fuller and of far greater value. The student in charge, being free from all details of work, by constantly watching all his men, may be as confident of the correctness of his results as if he had performed all the work himself. The ores will be chosen for the different students in such a manner that they may represent as large a variety of metallurgical work as possible.



MINING LABORATORY.



METALLURGICAL LABORATORY.

* * * * * * * * *

"In this report some reference should be made to the spirit with which students have taken hold of this work. The tone of feeling among them has shown that they have thoroughly appreciated the character, the use, and the demands of these laboratories. All work has been most cordially and carefully done, and it seems well nigh certain that when the resources of the laboratory are developed, which will undoubtedly be accomplished the coming year, the students will reap far more benefit from this course than was at first anticipated, when the difficulties were not only not overcome, but had not yet been discovered.

"When preparing a young man for the possibility of filling responsible positions in after life, there seem to be three very important qualities to be developed in him; he needs scientific attainments, capacity for organizing and directing work, and character or tone. Mere scientific attainments are to be derived more especially from books and lectures, while quick ready judgment, inventive skill, self-reliance and directive power can be brought out only by practical work, such as the laboratories furnish. The character or tone developed in the student depends in no small degree on the influences around him. When the instructor joins heartily with students in their hard work, and contributes to its full success, the experience of the past warrants us in believing that an earnest, determined enthusiasm will be the prevailing spirit among them. Energetic, persevering effort is best induced by the living example of those who show the power of overcoming difficulties."

It will, we are sure, be admitted at once, by every one of our practical readers, that the progress here indicated, by our "down-east" friends, in *learning how to teach*, places them much in advance of anything *we* have in these latitudes. Our colleges throughout the middle States must begin to sweep away their cobwebs.

Transparent Gum.—A little glycerine added to gum or glue is a great improvement, as it prevents the gum or glue becoming brittle. It also prevents gummed labels from having a tendency to curl up when being written on.

Chemical Repertory.

No. 108.—April 2, 1874.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

1058. Coal in Sweden.—Sweden imports coal from Great Britain, but it is anticipated that she will soon export fuel to other countries, as large mineral fields have been discovered in the province of Skara, and trial borings have been made in one case to 560 feet, twelve seams being found, varying from eight to twelve feet in thickness.

1059. Blasting Materials.—About 600,000 pounds of giant powder was manufactured on the Pacific slope in 1873, and all of it was sold in California and the Territories. The Comstock mine alone used 100,000 pounds. No. 1 sells for 75 cents and No. 2 for 50 cents per pound. The sales increased 30 per cent. over those of 1872. There are several fuse factories in California, one of which alone made 7,000,000 feet in 1873.—*Iron.*

1060. Friction Sealing-Wax.—At the Vienna Exposition were shown small sticks of variously colored sealing wax, tipped with an inflammable compound, which, when ignited by friction, burns and fuses the wax, permitting it to be used very conveniently, without wasting or dropping, as is usually the case. The quantity in each stick is sufficient for one common or two small seals.—*N. Y. Tribune.*

[Prof. Phin, Editor of the *Technologist* comments on this, to the effect that this device is even older than friction matches.—Ed.]

1061. Water-proofing Leather.—Dissolve three-quarters of an ounce of paraffine in a pint of lard oil. The best quality of oil should be used. It will be necessary to heat the oil slightly in order to dissolve the paraffine. This solution may be rubbed on boots once a month, and is said to render them perfectly water-tight, at the same time that it does not interfere with the blacking. If the solution is found to make the leather too stiff the amount of paraffine in proportion to the oil should be reduced.—*American Artisan.*

1062. Determination of Nitrogenous Matters in Water, Etc.—Piuggari first determines the free ammonia either with Nessler's reagent, or by adding one or two drops of phenol to 5 or 6 c c. of sodium hypochlorite, and comparing the violet-blue color produced with a normal solution. The nitrogen existing as organic matter is then oxidized by heating with a mixture of silver chloride and caustic potash to 50°—60° for several hours; it is then reduced to ammonia with potash and aluminum foil, and estimated as before. By alternate reduction and oxidation, nitrogen in the three forms of combination may be estimated in one portion. The author uses half a litre.—*Academy of Sciences.*

1063. Estimation of Sulphur in Iron and Steel.—T. J. Morrell.—The estimation of sulphur in iron is sometimes conducted by acting upon the metal with hydrochloric acid and precipitating some metallic sulphide by the evolved sulphuretted hydrogen. The author finds that if an ammoniacal solution of a cadmium salt be used to arrest the sulphuretted hydrogen, the precipitated cadmium sulphide may be weighed directly, and thus the usual oxidation and estimation as barium sulphate dispensed with. Test analyses are given proving the accuracy of the results. —*Chemical News.*

1064. Hay-Tinder.—L. A. Buchner (N. Repert. Pharm).—The partially burnt residue of a heap of hay which had spontaneously ignited, on attempting its removal about two months after harvesting, was a kind of tinder of a brown-black color, in which every blade could be detected; it gave off aqueous and empyreumatic vapors on heating, and was generally of the nature of a partially formed coal. If heated to between 250° and 350° it ignited when brought into contact with air. The author and H. Ranke also found that hay or grass heated to between 228—350° turned to charcoal, possessing pyrophoric properties. —*Jour. London Chemical Society.*

1065. Bad for "Merry England."—As a sample of a very common "state of things" in our mother country, we cite what a British contemporary says of Bolton (not far from Manchester): "Complaints are made that 'the water supply has for several weeks been so excessively bad as to be quite unfit for domestic use. It produces nausea even when made into tea or coffee, and has not only caused much sickness that has prevailed in the district, but will continue to create disease so long as it is supplied. The water, from its taste and smell, appears to be impregnated with matters used for fertilizing the land.' A Corporation apologist explains that there are no filters, and that the mud gets into the pipes, and they have not water enough to rinse the pipes out with; that they would like to have filters, but these cost money, and that is a large question; and so on in the usual style."

1066. Process for Bending Glass Tubes.—The *Polytechnisches Notizbl tt* calls attention to the fact that a perfectly round bend of any curvature may be given to glass tubes if they are filled with fine dry sand and closed at both ends when heated for bending as by a Bunsen burner. A similar plan is available with copper and lead tubes.

[This is exactly the method announced two or three years since by our American chemist Dr. Gallatin, of New York, which has been reflected back to its original source.—Ed.]

1067. Oil-Tank Explosions.—Patent of Hazen Titus, St Petersburgh, Pa., assignor to himself and Thomas Cushing, same place.—This invention has for its object to furnish oil tanks or reservoirs, so constructed that, should the oil take fire and an explosion take place, the exploded gases may escape freely, and the tank may be again tightly closed automatically, so as to smother the fire and thus save the oil. The invention consists in oil tanks provided with a number of openings, closed with hinged covers, to allow the exploded gases to escape freely without injury to the tanks. The covers are so arranged that they will fall back by their own weight as soon as the pressure is removed, and tightly close the tank, smothering the fire and preventing the oil from being burned up.

1068. Petroleum for Burning Brick.—A burner is in use, in Canada, by which residuum or crude petroleum is used instead of coal or wood in brick kilns. By a simple contrivance the nozzle of the burner is made to throw the flame directly downward at the first firing; and, after burning the head (as it is termed), this nozzle is replaced by a straight one, the change being effected in a few moments. The flame is thereby thrown into the arch any required distance, burning the whole kiln from one end, and doing it in much less time than by the old method, and with perfect success as regards the quality of the burning. One man, by this process, will be able to do as much firing as a dozen with the old, as he can attend to as many arches as may be set going in one yard, and by this means save a large item in labor. The tar or petroleum consumed will not cost as much as wood at $3.50 per cord.—*Item going the rounds.*

1069. "Fireless Locomotives."—Mr. Lamm, the New Orleans inventor, whose name was ere-while noted in connection with *Ammonia-Horse-Cars*, has produced a locomotive carrying a reservoir of power in the form of superheated water under heavy pressure. Regarding this invention, much noised abroad of late, the President of the New Orleans and Carrollton Railroad Company writes: "The fireless locomotives have now been in use two months on a portion of this road of about three miles. They have resulted in a gain over horses of twenty minutes to the round trip. They are more manageable than horses, being more readily stopped and started, and give the driver opportunity to make change and attend to the passengers. They start with 123 pounds pressure, make the round trip of six miles, and get back to the starting point with 40 to 50 pounds. One dummy is equal to nine mules.

1070. Action of Dilute Solutions on Lead.—A paper by M. P. Muir.—The facts stated in this paper are: 1. A nitrate, and particularly ammonium nitrate, increases the solvent power of water for lead more than any other salt experimented with. 2. Small quantities of nitrates seem to increase this solvent power nearly as much as larger quantities. A litre of water containing ·02 grm. of a nitrate was found to dissolve nearly as much lead in a given time as double the quantity of salt. 3. Chlorides, at least calcium chloride, do not increase, but rather diminish the action of water on lead, and that too, when the water contains a nitrate. 4. Carbonates diminish the action of water on lead more than other salts. One part of potassium carbonate in three thousand parts of water will prevent almost entirely the action of water on lead. 5. Sulphates behave like carbonates, though they are quite as effectual in their action as carbonates. 6. Water containing a nitrate, and at the same time a carbonate and a sulphate, will have but little, if any, action on lead.—*Amer. Chemist.*

1071. Polluted Well in Utica.—I remember some eight or nine years ago, in our Orphan Asylum, I was asked to go up and see some sick children. The majority of them were sick with malarial fever, and several of them died. I went home that evening, and on returning the next morning I made an inspection of the grounds. I found a number of piles of decayed vegetable matter, and also a stream, partially covered in its course with undergrowth and rubbish, running through the grounds. On examining the water in the well it was found to be in a foul condition. I took some of it home with me, evaporated it, and found in it large quantities of organic matter. This stream ran within about sixty feet of the well, the barn-yard being nearer. We agreed simply to drain the water from the grounds into this stream, which we cleared of rubbish, and I think there has not been a case since. The asylum was erected upon one of the highest plots of ground in the vicinity, still it was undrained.—Dr. J. P. Gray, *in Sanitarian for March.*

1072. Aerial Navigation.—De Fonveille.—The author thinks it highly probable that the gas of a free balloon differs in temperature from the external air by 10° C., at least twice daily. This rupture of thermal equilibrium must limit its course to a very small number of days; independently of other disturbing causes, it would render a passage across the Atlantic impossible. Nor can the disturbance be obviated by closing the orifice of the balloon with a hermetic valve. A small balloon of transparent caoutchouc explodes loudly when merely pierced with a pin; this is due to the surprising rapidity with which the membrane is rent, although the pressure of the hydrogen does not greatly exceed that which would obtain within a large free balloon, where it might be sought to neutralize the effects of the solar dilatation. Nor would the greater resistance of envelope obviate the disaster. M. De Fonveille also remarks on the despatching of pigeons from balloons at regular intervals, on the disastrous voyage of Mountain and Bailey, and other topics.—*Academy of Sciences.*

1073. Frost by Evaporation.—By directing upon a sheet of spongy paper, wet with bisulphide of carbon, a spray of pure water, hoar frost is not formed; but if the condstions be reversed, and the bisulphide applied in a finely divided spray (according to M. Decharme), a circle of arborescence becomes quickly apparent. The same jet, directed on the bulb of a thermometer, produces first hoar frost and then arborescence, together with a lowering of temperature

from +50° to —7° Fahr. Arborescence thus formed upon a glass plate may be retained long enough for examination by the microscope. Other liquids which are capable of producing similar effects to bisulphide upon spongy paper are chloroform and rectified sulphuric and bromhydric ethers. The icy arborescence is believed to be purely aqueous. Its point of fusion corresponds exactly with 0° C. (32° Fah.), and it has no taste or odor after the evaporation of the volatile liquid with which it is impregnated.—*Sci. Amer.*

1074. TORMENTING A THERMOMETER.—In prosecuting experiments to ascertain the expansion of various substances by heat, the following experiment was tried: The bulb of a thermometer was suddenly plunged into melted lead. The mercury instantly darted down far below zero. The action was so quick that the point could not be ascertained. This was caused by the sudden expansion of the bulb by heat before it reached the mercury by conduction; this then began to rise very rapidly, and before it had arrived at the top of the tube the bulb was withdrawn. The experiment requires adroitness, for, as we all know, the instant that the mercury touches the top, the bulb will burst. This must be greased before immersion In the fused lead, otherwise a film of the metal will adhere and retain sufficient heat to carry the mercury to the top with a consequent fracture. A thermometer treated in this rough manner afterwards showed an index error of six degrees, the mercury having risen to that extent; but after a few days the equilibrium was partly restored, and the error remained permanently at three degrees.—*Engineering and Mining Journal.*

Expenses on Bituminous Coals to the Seaboard.

West Virginia gas coal, to Baltimore $5 per 2000 pounds. When reshipped to Eastern ports, $4·50.

George's Creek, by C & O. Canal, to Georgetown $1·86 per ton of 2,240 pounds.

George's Creek, by C. & O. Canal, to Alexandria $1·97 per ton of 2,240 pounds.

George's Creek, by B. & O. R. R. to Baltimore, $2,70 per 2,000 pounds, and 4 cents per gross ton for use of cars.

Pennsylvania Gas Coal from Irwin or Penn Station to West Philadelphia;

In cars of Pennsylvania Railroad Company per 2,000 lbs. $5; in compromise (or individual) cars per 2,000 lbs. $4. On bituminous coal from Osceola, on T. & C. Railroad, to West Philadelphia, $2.55 per 2,000 lbs.

The bulk of the George's Creek coal passes over the Cumberland and Pennsylvania Railroad, it is 32 miles in length. The rates charged are as follows:—4 miles and under, 5 cents per ton per mile, 5 miles and less than ten, 4 cents per ton per mile; over 10 miles 3 cents per ton per mile.

The charges for transportation of coal on the Chesapeake and Ohio Railroad are 1¼ cents per ton per mile, and the freight from Richmond to New York ranges from $2 to $2.50 per ton. The freight from Cannelton to Richmond is about $4.50 per ton on bituminous coal, and $6.00 on cannel.—*Seward's Journal.*

Safety in Noxious Gases.—The Inspectors of mines have arranged for a series of experiments, which are to commence in a few days, for the purpose of testing the practical value of a French invention known as the aerophore, or the Denayrouze mining apparatus, which has already been practically tested in various mines in Saarbruck, Montpelier, Arres, Brassac, Blanzy, Bruay, Epinac, Creuzot, and in a number of other places in Germany, France, Belgium, and Sardinia. The first experiments in England are to be made in some of the mines at Wigan early next week. The principle upon which this invention is based has been known for some years, but it is claimed that it has been brought to perfection within a recent period. It is said to solve the problem both of breathing and of affording light in the midst of the most noxious and poisonous gases.—*London Mining Journal.*

American Water-Gas Researches.

REPORT OF PROFESSORS SILLIMAN AND WURTZ.

[Continued from page 94, No. 6.]

RECAPITULATION OF ALL THE RESULTS ON BOGHEAD COAL.

A. By the hydrocarbon process:

Yield of gas per ton of coal by the average of four sets of experiments detailed above.....25,565 cu. ft.
Illuminating power of 5 cubic feet, average of 4 sets of experiments.....27.98 candles.
Total economical effect, in terms of spermaceti equal to 1 ton of coal, average of 4 sets of experiments.....2,356·59

B. By the common method as already given:

Yield of gas per ton.....13,619 cu. ft.
Illuminating power of 5 feet.....26·45 candles.
Total economical effect, in terms of spermaceti equal 1 ton of coal.....1,235 05 lbs.
Gain in gas by hydrocarbon process.10,946 cu. ft.
Percentage gain in gas.....80·3 per cent.
Illuminating powers substantially identical.
Gain in total economical effect, estimated in terms of spermaceti equal one ton of coal, equal.....106·35 per cent

WOLLONGONG CANNEL, AUSTRALIA.

It may become a matter of much interest to those living on the Pacific coast of the Unitad States, to find an enriching material more available than the English cannels, which are necessarily very costly when laid down, for example, at San Francisco. In the Wollongong district, New South Wales, and under the Kembla mountains, is a series of bituminous beds containing cannel coal, somewhat resembling the Boghead, but much less earthy, as will be seen by the analysis which follows, and amazingly rich in oil and gas. Associated is also a semi-elastic bitumen in a seam 18 inches in thickness, yielding about sixty gallons of crude oil to the ton, by distillation. This important deposit is on the sea coast, only about forty miles south of Sidney, and quite available to transportation.*

The following results have been obtained by us at the experimental works of the Manhattan Gas Light Company, in New York by H. H. Hall, Esq., of Australia, and from whom the data given here were obtained.

Average yield (5 charges) of gas per ton.....13,716 cu. ft.
Time of charges.....30 minutes.
Coke (very light and lustrous).....424 lbs. per ton
Illuminating power of 5 feet of gas burned in Scotch fish-tail burner....132·94 candles.
One bushel of lime purifies.....5686 cu. ft.
Gas from one ton equals sperm.....6251·67 lbs.

Analysis of the coal:

Volatile matter	82·5
Fixed carbon	6·5
Ash	11·0
	100·0

The gas was so rich that its candle power could be measured only by largely diluting it with common street gas.†

* The only account we have seen of the geology of this region is that given by Prof. James D. Dana, in his *Report on the Geology of the Countries visited by Wilkes's U. S. Exploring Expedition*, p.p. 449, *et seq.*; accompanied by a map of the Illawarra coal field, in which the Wollongong cannel exists. This remarkable mineral was discovered long subsequent to the date of Prof. Dana's explorations in 1840. The writer examined and analyzed the coals brought home by Prof. Dana from Australia, which analyses are published on page 476 of the Report quoted. But among them there was nothing at all resembling the remarkable body now for the first time, as he believes, introduced to the knowledge of gas chemists.—B. S.

† Mr. Young, of Glasgow, well known everywhere for his researches upon coal oils, of which industry he is a well known promoter, obtained the following results on the Wollongong cannel, by distillation for oil.

The cannel yields per ton of crude oil, sp. gr. 0·860 = 152 gallons, divided as follows:

"Mineral turpentine" (light naphtha)...sp. gr.=	0·730	= 8	gals
Burning oil..... "	0·818	= 72	"
Lubricating oil..... "	0.890	33	"
Paraffine, 49 pounds..... "		5	"
Loss, ash, etc..... "		32	"
		152	

Gas found by Mr. Young.....16,800 cu. ft. per ton
(Communicated to B. S. by Mr. H. H. Hall, of Australia.)

Even when 10 per cent. of the Wollongong canne gas was added to 90 per cent. of street gas, whose illuminating power was 14 98 candles, it was found to be still too rich to burn in the 15-hole standard argand. But it could be burned at the rate of 5 cubic feet in a Scotch tip fish-tail burner, giving from the mixture an illuminating power of 26·54 candles. From these data, the candle power of one cubic foot of the gas of this material is equal to 26·59 candles— a degree of illuminating power unexampled, so far as we are informed, in the records of gas making from any material heretofore examined. This appears more clearly on comparing this result with some of the best known of the cannels of England and the United States, thus:

					1 c.f.= candles
Wollongong cannel	= lbs.	sp'm p'r ton		6251.26	26·54
Boghead cannel	=	"	"	*1967·10	.....
" "	=	"	"	†2755·6	10·38
" "	=	"	"	‡1235	5·29
Albert coal, N. B.	=	"	"	§2511·57	9 85
Peytona cannel	=	"	"	§1440	8·4
Lesmahago cannel	=	"	"	1529	8·77
Capeldræ cannel	=	"	"	1670	10·01
Donibristie	=	"	"	1277·5	7·51
Wigan cannel	=	"	"	627·4	3·04
Pelton Main (c'k'g)	=	"	"	532	3·12
Ramsay's Newc'stle	=	"	"	553	3·33
Westmoreland, Pa.	=	"	"	§ 541·25	3·32

From these figures it appears that the iliuminating power of the Wollongong cannel, whether estimated in pounds of sperm equal to one ton, or in the illuminating power of one cubic foot of the gas, is more than twice as great as Boghead by Dr. Fyfe's exceptional result, and ten times as great as the celebrated Wigan cannel.

The gas of this material loses 41·8 per cent. of its illuminating power at—6 degrees F.—a degree of condensation not greater than developed by the same low temperature in some of the results quoted in this report on common street gas. The limited quantity of this mineral at our command was insufficient to charge our hydrocarbon retorts: and moreover we had no means of collecting the gas in a separate smaller holder for examination; its extraordinary illuminating power entirely exceeding the capacity of the standard argand, unless very largely diluted with common street gas. But from the general similarity of the material to the Boghead in its physical aspect (impurities excepted), we anticipate an increase of total economical effect by this treatment, fully equal, if not greatly superior, to that obtained from the famous Scotch mineral.

GENERAL SUMMARY OF WORKING RESULTS.

During the four months when the Fair Haven Works were under our direction, the results obtained are given in detail in Tables A, B, C, and D in the appendix; but it is convenient to recapitulate them in the following condensed form:

Table 1

Date.	Gas made by record of meter.	Gas made less correction for air	Observed candle power	Corrected candle power	Yield per pound by meter.	Yield per pound air off.
Dec. 1868...	353 600	325 312	15.67	19·67	6.04	5.56
Jan. 1869...	182 910	164 610	15.32	20·32	6.67	6.
Feb. 1869...	333 100	309 783	16.78	20·98	6.64	6.17
March 1869.	420 400	412 225	18.77	20·45	5.96	5.81
Tot l prod.	1,290 000	1,211 930	.....	.....	.....	.....
Averages...	.....	.....	16.63	20·35	6 33	5.88

Disregarding for the moment, the particular kinds of enriching substances employed and their varying quantities (all of which are given in the details quoted), for the sake of a general comparison, we find the following results, viz.:

Each ton of coal carbonized to produce the aggregate of 1,211,930 cu. ft. of gas (corrected for atmospheric air from analyses) gave gas.....13,171 cu. ft.
Having a candle power of..... 20·35 candles.
Giving pounds of sperm equal 1 ton of coal.....913·80

* Advertisement of the proprietors. † Dr. Fyfe.
‡ Manhattan Co. *loc. cit.* § Our own results.

The nearest term of comparison on an equally large scale of production which we have, is that offered by the results at the New Haven Gas Works for 1868, where the average yield, with substantially the same coal, on a total make of 61,500,000 cubic feet, gave per pound of coal carbonized, 4·11 cubic feet of gas, of an average candle power of 18 candles.

Each ton of coal gave therefore gas.... 9,206 cu. ft.
Average illuminating power..... 18 candles.
Equal to pounds of sperm for one ton. 568

These figures offer us the following important comparison of the practical results of the ordinary process of gas making with those obtained on a large scale, and with substantially the same coals, by the Gwynne-Harris hydrocarbon process, viz. :

Gas produced by the hydrocarbon process from each ton of coal carbonized.....13,097 cu. ft.
Gas produced from same coals by ordinary process, per ton.....9,206 "

Increase in the volume of gas made by the hydrocarbon process.....3,891 cu. ft.
Ratio of increase per cent.....42·26 per cent.
Candle power from the hydrocarbon gas.....20·35 candles.
Candle power from the New Haven gas. 18 "

Gain in candle power..... 2·35 "
Ratio of increase of illuminating power.....13 per cent.

The total economical effect of the two methods is, however, more clearly seen by the following comparison; in which the value of a ton of coal is given in terms of the spermaceti required to produce an equal total illumination :

Pounds of sperm equal to one ton of coal, on the average of 4 months, at Fair Haven, by the Gwynne-Harris hydrocarbon process..... 917·54 pounds.
Pounds of sperm equal to one ton of like coals carbonized at New Haven by common process, average of 12 months.....568· pounds.

Gain in total economical effect.....449·54 ponuds.
Percentage ratio of gain.....60·88 per cent.

In this comparison, it will be observed, we have used the numbers from our Tables, expressing the results after the application of the corrections due to atmospheric air found by analysis in the gas, and which, we conceive, express the truth. (See section on the effects of air on gas, page 66.) There may, however, be a doubt in some minds whether the gas is fully entitled to these corrections, which, it will be remembered, increase the candle power, but diminish the bulk of the gas recorded. We, therefore, subjoin another statement, in which the comparison is made upon the *uncorrected* record, thus—

Gas produced by the hydrocarbon process from one ton of coal carbonized.....13,940 cu. ft.
Gas produced from same coal by the ordinary process.....9,206 cu. ft.

Increase in the volume of gas made by hydrocarbon process.....4·734 cu. ft.
Percentage ratio of increase in gas....51·42 per cent.
Candle power of the hydrocarbon gas, uncorrected for atmospheric air..... 16·63 candles.
Candle power of New Haven gas same coals..... 18· candles.

Apparent loss in candle power..... 1·37
Percentage ratio of loss in candle power..... 8·26 per cent

But the true relations of the two methods are best seen when we compare them by the total illuminating effects produced, in pounds of sperm, as before, thus :

Pounds of sperm equal to one ton of coal, on the average of 4 months, at Fair Haven, by hydrocarbon process.....794·82 pounds
Pounds of sperm equal to one ton of like coals, carbonized at New Haven by common process, average of 12 months..... 568 pounds.

Gain in total economical effect.....226·82 pounds.
Percentage ratio of total gain.....39·93 per cent.

There are few gas engineers, we conceive, who would not be satisfied with a process which is capable of increasing their total gains by 40 per cent., with the use of ordinary caking coals, and with no costly changes in the apparatus. At the same time, in large works, properly conducted, we are persuaded that the results in practice may be brought up to the first of the two statements here presented.

[To be continued.]

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

An Explanation.

Wheeling, O., March 11, 1874.

Mr. Editor: An observation in the editorial comments in the Gas-Light Journal, on my reply to certain articles that appeared some time ago in the *Wheeling Press*, would seem to require an explanation, why the reply was sent to the Journal after the lapse of time alluded to.

I had no intention at the time of the discussion here to publish it in the Journal, as the matter for the most part had only a local interest, but the correctness of my assertions, my accuracy in quoting authorities on the subject, etc., etc., having not very long since been disputed, friends of mine urged me to have the discussion published in your Journal, in which if I had made an incorrect statement it would be set right by the Editor. Under these circumstances, and as the columns of your Journal have in a recent number been generously offered for the insertion of matters touching gas interests, I forwarded to the Journal my replies to the hostile remarks in the *Wheeling Press*. I would here correct a misprint in transferring the reply; instead of "¾-inch" pipe, it should read ⅜ inch. Yours respectfully,

Arthur Browne,
Sup't Wheeling Gas Works.

Petroleum Gas.

Niagara Falls, March 14, 1874.

Mr. Editor: I must ask the indulgence of answering, through your columns, some of the many enquiries called forth by my letter of February 10, on the above subject, which appeared in the Journal of 2nd March.

And first: A still for use with petroleum cannot well be of a less capacity than twenty barrels (for convenience of cleaning out the residuum which will be found after a charge is taken off) and it may be of forty barrels, or 100 or 500 barrels capacity; but very large stills would not be economical in the use of fuel, and those that will be found most economical in that respect will be of a size that requires to be charged twice a week, and of course in that case the extent to which it is intended to employ petroleum, will determine the size of the stills. The reason that a still charged twice a week will be found more economical than one charged once a week, consists in the fact that very slow firing wastes more fuel by radiation than brisk firing does; and when a still is fixed as it should be in this respect, there will be no loss in fuel, from the fact of having two fires, viz., one for the still and one for the retorts, except what may be lost from the fire under the still, by radiation of the still and vapor pipe leading to the retorts, because whatever heat the petroleum vapor contains on entering the retorts is so much heat saved to them. This fact accounts for the large amount of gas that can be fixed in a retort, as compared to the amount that can be *made* in one.

As to *what* quantity of gas can be fixed in a retort, that of course depends on the size of retort, and the heat at which it is kept—a 12 by 20 inch double end 18 foot retort, *i. e.*, two nines kept at a good heat will fix (expand beyond the point of condensation) something over 2000 feet per hour, which is much more gas than can be made in such a retort.

As to different degrees of heat being required for fixing the vapor from different densities of material, that will not interfere with the working by this system, nor vary the quantity of gas made to any extent, because the first product of distillation from crude petroleum is its most volatile portion, and driven off with very low heats; consequently the vapor contains very little heat, and requires the addition of more degrees of heat for converting it into a fixed gas than the vapor from the more dense portions, although the latter requires a higher temperature for being so converted than the former does, but not to the extent of the difference in the degrees of heat that the vapor contains, so that throughout the working of an entire charge the flow of vapor would not require to be changed much, if the heat of the retorts remained uniform, but the fire under the still would have to be increased in the same ratio that the density of the material in it increased, so that towards the latter end of the charge being driven off, the bottom of the still will assume a dull red hue, the vapor driven off being of a correspondingly high temperature.

As to any danger of bursting the stills by too much fire, by accident, or otherwise, that must be provided against by having a safety valve, the outlet of which may terminate in the petroleum storage, causing all vapor escaping by over pressure to be condensed and saved for future use. There however will be very little trouble from this source, if any attention is given to the state of the mercury gauge that indicates the pressure in the still, for an ordinary still will sustain a pressure of 30 inches of mercury without injury.

If it should be desirable in any works to employ hydrogen as a diluent for petroleum gas made in this manner, it may be obtained by simply introducing superheated steam into the gas-fixing retorts, in conjunction with the petroleum vapor.

When I say superheated steam, I mean steam so heated that if it be discharged against wood that the wood will be set on fire. Steam of a lower temperature will answer, but has the effect of cooling down the retorts too much. This highly superheated steam may be obtained from the lower flues and not cost any extra fuel.

It may be believed that steam so heated in iron chambers or pipes will become hydrogen gas, and to some extent it may, but no considerable quantity of gas can be made in this manner, experience having shown that steam made sufficiently hot to set wood on fire, will nearly if not quite all return to water when allowed to impinge against a cold water surface.

As to any advantage being obtained by partially or wholly filling the gas fixing retorts with broken or whole fire brick, I think it must be clear it can serve no good purpose, as it adds nothing to the heating powers of the retort, and contracts the area to the extent to which it is filled, compelling the vapor to pass through more quickly and preventing it from becoming as thoroughly fixed as it otherwise would be.

I think a loose fire brick wall across at or near the center of the retort, would be of some service by breaking up the column of vapor, and bringing it all in close contact with the retort.

As to any patent covering this mode of making gas or any part of it, I do not know of such a patent, and if there is one I don't see how it will benefit the owner if it is not put in practice.

Yours most respectfully,
Ananias Smith.

P.S.—The color of petroleum gas when properly fixed is a very light drab before it reaches the hydraulic main. If it have a blueish shade a portion will condense. If it have the snuff-colored shade, it has been fixed too much, that is, free carbon has been produced to some extent, and will be deposited in the hydraulic main. The shade of the fixed gas can always be controlled by the valve admitting the petroleum vapor into the retorts.

A New Standard Burner.

[Just as this issue has been all made up for the press, the following new Gas Bill comes to hand, and we are obliged to crowd out matter of more importance. It is stated to be ready to be reported to the wise men assembled at Albany, "by the Committee on Trade and Manufacture, as soon as an opportunity is offered."

If "*three* cubic feet per hour" is not a misprint or clerical error for *five* feet, we have here a marked addition to the Curiosities of Gas-Legislation. The absurdity which imposes on the consumer the task of

being (or employing) his own gas-analyst, we have had before in previous model bills. We should think it might not hurt anybody to let this bill pass as it is—unless possibly the first consumer who should attempt to get the $100 reward. None would attempt it a second time.—Ed.]

An Act to regulate the quality and supply of illuminating gas, and for the protection of the manufacturers and consumers thereof.

The People of the State of New York, represented in Senate and Assembly, to enact as follows:

Section 1. The standard or unit measure for the sale of illuminating gas by meter in all cities and villages of this State, shall be the cubic foot, containing sixty-two three hundred and twenty one thousandths pounds avoirdupois weight of distilled or rain water, weighed in air of the temperature of sixty-two degrees Fahrenheit scale, the barometer being at twenty-nine and one half inches.

Sec 2. Illuminating gas shall not be merchantable which has a minimum value of less than sixteen candles; that is, a burner consuming three cubic feet per hour shall give a light as measured by the photometric apparatus in ordinary use, of not less than sixteen sperm candles, each consuming one hundred and twenty grains per hour.

Sec. 3. Whenever it shall be proven that the quality of illuminating gas furnished by any corporation or individual under the laws of this State is below the standard as fixed in the preceding sections, such corporation or individual shall not be authorized to collect any compensation for the gas so furnished; and the person or persons who shall so prove before any court of record that such gas is not equal to the standard as herein established shall receive a reward of $100, to be paid by the corporation or individual so convicted of violating the provisions of this act, and such corporation or individual shall also pay the costs of the court in case of conviction.

Sec. 4. Every gas meter supplied to consumers by such corporation or individual shall bear a mark indicating the capacity of such meter and the date of its being tested: and whenever any consumer shall prove that the meter furnished him or her by said corporation or individual is wrongly marked said corporation or individual shall not be authorized to collect any compensation for the gas furnished such consumer during the time that such meter has been in use; that is, since the date of its being tested.

Sec. 5. Such corporation or individual shall not be authorized to demand a deposit of more than $5 in advance from any new consumer for the first week, and after that the price of the gas used by the said consumer for the first week shall be the sum authorized to be so collected in advance, and such corporation or individual shall pay interest at 7 per cent. on all deposits made under the provisions of this act.

Sec. 6. All acts or parts of acts inconsistent with this act are hereby repealed.

Sec. 7. This act shall take effect immediately.

Whitby Jet and Its Manufacture.

By John A. Bower, F.C.S.

Read to the *Society of Arts.*

[Abstract: A long historical account of the matter we must omit.—Ed.]

Jet has been worked a long time in the Whitby district, even long before the history of the famous Abbey St. Hilda forms a part of her records; but how long history does not decide for us. I find the following mention of it in "Charlton's History of Whitby:"

"I myself," says this learned author, "have lately viewed the ear-ring of a lady who had most certainly been buried in one of these houses long before the time of the Danes' arrival in Britain; it is of jet, more than two inches over and about a quarter of an inch thick, made in form of a heart, with a hole to its upper end, by which it has been suspended to the ear. It lay, when found, in contact with the jawbone; and if any credit be due to antiquity, must assuredly have belonged to some British lady who lived at or before the time the Romans were in Britain, when ornaments of this sort were universally worn.

The Saxon poet, Cædmon, who died and was buried at Whitby Abbey, in his, "Translation on Jewels," refers to jet in the following lines:

"Jeat stone, almost a gemm the Lybians find,
But frutful Britain sends as wondorous kind;
'Tis black and shiny, smooth and ever bright;
'Twill draw up straws, if rubb'd till hot and bright;
Oyl makes it cold, but water gives it heat."

The electrical phenomena referred to by Thales in regard to amber would apply equally well to jet, for we find that on being rubbed or excited in the same way it has the tendency to draw particles of straw or any light substance towards it with quite as much energy. From this circumstance it has probably acquired the name of "black amber."

A very large and increasing trade is now done with the United States. As an illustration of how events influence the trade in a fancy and ornamental article of this kind, I might name that the death of the Duke of Wellington gave a wonderful impetus to it and articles of a better class were then in demand. Again, the lamented death of the Prince Consort gave it another impulse, but it is now steadily on the increase, and employs about 1,500 hands, or gives support to nearly one-third of the population of Whitby. Before leaving this historical portion of our subject, allow me to give a few statistics, dating from the year 1860, which show the increase in the value of the trade. In 1860, it realized about £45,000; in 1861, £50,000; in 1862, £53,000; in 1863, £55,000; in 1864, £57,000; in the year 1870 it had reached £84,000; in 1871 it had risen to £86,000; in 1872, to £88,000; in 1873, it will probably exceed £90,000. There is no doubt whatever that, as the taste of the workmen improves, and the ornaments are more widely distributed, even this growth, which has been rapid, will be still more so, and especially as the merits of jet as an article that "will wear" become more widely known.

What is jet? This is a question often put, but never satisfactorily answered. Nearly all the jet workers have an opinion on its origin, and most of them, in common with the greater part of the inhabitants of Whitby and its neighborhood, believe it to be of ligneous origin. Some, however, believe it to be of mineral origin, and others think it combines the two. Taking the opinion of Mr. Martin Simpson, the curator of the Whitby museum, who has studied the geology of this district exceedingly well, and with whom I have talked on this subject, he put his theory as follows:

"Jet is generally considered to have been wood, and in many cases it has undoubtedly been so; for the woody structure often remains, and it is not unlikely that comminuted vegetable matter may have been changed into jet. But it is evident that vegetable matter is not an essential part of jet, for we frequently find that bone and the scales of fishes have also been changed into jet. In the Whitby Museum there is a large mass of bone, which has the exterior converted into jet for about a quarter of an inch in thickness. The jetty matter appears to have entered first into the pores of the bone, and then to have hardened, and during the mineralising process, the whole bony matter has been gradually displaced and its place occupied by jet, so as to preserve its original form."

To this latter opinion I am inclined to agree, for it has the appearance of a substance that has distilled from the rock, and in some cases has impregnated vegetable, and in other cases animal substances, while in others it has simply filled up a fissure in the rock and solidified. In some specimens I have seen the grain, apparently of wood, distinctly, in others, scales and bones of fishes, and in one of the best specimens that has been found here, the mass in form and structure was that of a tree, with bark, knots, and roots, and in the curled portions of the roots, stones and soil conglomerated were imbedded.

That it has been formed from a distillate from what is called the jet rock is supported by these facts. Experiments tried on portions have been successful, and proved that at least ten gallons of oil could be extracted from one ton of the shale, and that this pure oil gave out a clear and brilliant light when burnt. A piece of jet on fire gives out a similar brilliant, clear light. Again, the substance is always found in seams, detached, and in a horizontal position, and spreads itself out in shallow layers, as water or fluid substances always do. The two kinds with which we are acquainted are the hard and soft; these are evidently of distinct species. The jet rock occurs in the lias formation. This formation, commencing at the peak about eight miles south of Whitby, traverses the whole coast to about fifteen miles north of Whitby, and from the bold and precipitous cliffs that skirt the sea to Tees' mouth. The rock divides into the upper and lower lias, with a marlstone series intervening, in the upper part of which we have the Cleveland ironstone. Then comes the dogger, or jet rock, and it is here where our "hard jet" is found in compressed masses or layers of various lengths and thicknesses, some having been found of an inch or two long and one eighth thick to masses thirty inches wide, six feet long, and four inches thick. It appears that the largest piece ever found was six feet four inches in length, four and a half to five and a half inches wide, and one and a half thick, weighing eleven and a half pounds. The nett price was ten guineas; for this sum it was offered to the Curator of the British Museum; he declined to purchase it, and the specimen wrs afterwards sold for fifteen guineas, and cut into four inch crosses.

Whatever may be the actual formation of jet, that known as the hard jet is most worked, it not being thought worth while working the soft species, since the importation of the Spanish article. The hard jet has a specific gravity of about 1·238, has a conchoidal fracture, a resinous lustre, it gives off a bituminous odor when burnt, is an electric, and a bad conductor of heat. It was formerly obtained in the largest quantity by working in the cliffs, by a process called "dessing" (very dangerous work), that is, by clearing away and hewing down the cliff-sides till jet ends protruded; the seams were then followed till exhausted. Some seams have realized as much as £1,000, and have been discovered in a short time. At other times, however, men have been employed for weeks, occasionally for months, and have found nothing, in fact have been on the point of giving up, when they have unexpectedly come upon a seam that has fully repaid all their labors.

Were our space unlimited, further interesting extracts might be made from this long but interesting paper. In the discussion which followed—

Mr. Lockhart asked whether the lecturer did not not consider jet to be absolutely bituminous in its nature. He apprehended that was so, and that in specimens which had been spoken of as being in the form of wood or leaves, or animal bones, these substances had been infiltrated by the molten bitumen, and, under the tremendous pressure of the superincumbent lias, so driven into the pores of these materials as to assume their very form.

Mr. Bower replied that, in one instance, a portion of the root of a tree was converted into jet, the other portion retaining its original structure. Again, in the Whitby Museum there was a specimen, where the outer coating of a bone, to the depth of a quarter of an inch, was converted into jet, the other portion not being so converted. It seemed as if the substance had really exuded from the lias rocks, settled down into crevices, and hardened into jet. Many seams had a sort of core or centre, around which the bituminous stuff had conglomerated.

English Gas Purification Patent.

A. G. V. Harcourt, Christ Church, Oxford, and F. W. Fison, Burley in Wharfedale, Yorkshire. Improvements in the purification of gas, and in the extraction of residual products therefrom.—In these to purify the gas from sulphuretted hydrogen there is employed hydrated peroxide of iron, and to purify it from ammonia a solution of persulphate of iron is used. The solution of persulphate of iron is prepared from time to time by dissolving a part of the oxide in dilute sulphuric acid. To apply this liquid to the removal of ammonia it is sprinkled over the oxide during revivification, and before the oxide is replaced in the purifier. Thus the purifier is charged with a mixture of oxide and persulphate of iron, each of which acts independently. The oxide absorbs sulphuretted hydrogen, forming sulphide of iron, water, snd sulphur. The persulphate of iron absorbs ammonia, forming sulphate of ammonia and oxide. The amount of oxide in use remains constant, since all that is removed for conversion into persulphate of iron is restored by the addition of the persulphate of iron thus formed to the contents of the purifier and its reconversion into oxide by the action of ammonia. The residual products are extracted from time to time. The material is extracted first with water, which dissolves out the sulphate of ammonia, and next with dilute sulphuric acid, which dissolves the oxide, forming a solution of persulphate of iron. The undissolved residue consists of sulphur. By evaporating the solution of sulphate of ammonia and by washing and drying the residue of sulphur these substances are obtained at once in a saleable form. In addition, the ammonia and ammoniacal salts of the liquor from the condensers may be converted into sulphate of ammonia (reuniting this portion with the rest of the ammonia formed in the retorts), by heating the liquor by itself or mixed with lime in a vessel through which a current of gas passes to the purifiers.

Phœbus! Wot a "Pome."

[A lame and deformed Pegasus—let us call him *Pegasus*—has been "sliding on our cellar door." Some discontented and ill-conditioned Canuck, in Toronto, has saddled and mounted the hippogriff, but his flight is like that of a crippled gander His *afflatus* is in fact too much tinctured with "filthy lucre" to be regarded as particularly *divine*. The author of this elegant extract is one of those who will be tolerably well satisfied when his gas company has been brought to the point of *paying him* for the privilege of furnishing him gas; or rather—which is more probable—buying off his poetry, as we do with the street music grinders.

By the way, the following newspaper gem may be deemed somewhat pat in this connection:

"In Rochester so intense is the indignation at the gas monopolists that kerosene is becoming the general illuminator. The Coroner remarks, with sly originality, that he has 'struck oil' at last; and in nearly every family the mother-in-law and the man who will not sign the pledge are sent to bed with a kerosene lamp."—Ed.]

Gas man! Gas man!
Think you I'm an ass, man,
Putting in your pocket
  All the money that I make?
What are you about, sir?
I can do without, sir,
  Better, gas than money—
Or I'm making a mistake.

All the men you meet, sir,
In the public street, sir,
Curse you up and down,
  And say the swindle is too clear;
People want to know, sir,
What your books can show, sir,
Clearer than your gas bills
Make this thing appear.

Fraud or swindle, surely,
Somewhere lurks securely;
Somewhere, in your business,
  There's a nigger in the fence!
Come give us satisfaction?
Or some patent public action
Soon will show that fraud and gammon
  Make you rich at our expense!

Gas man! Gas man!
Are you made of brass, man,
Heart, and brain, and conscience—
  All as brazen as your pipes!
Let us hope another metal
Soon your little bill will settle,
And your voice be clear and manifest
  In little leaden types.

Ah! then your lying meters,
Those never-failing cheaters,
Will lie in vain to save you
  From a flood of public scorn;
A general indignation
Will make you rue the day, man,
  That ever you were born!

Gas man! Gas man!
It will come to pass, man,
If you don't repent,
  And cease to plunder honest men,
That down where Satan revels
With his twenty million devils,
You'll furnish endless light, and get
  No money back again!

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THURSDAY, APRIL 2, 1874.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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PRACTICAL SCIENTIFIC TRAINING IN GAS MANAGEMENT.

Some readers may imagine, from our cessation, now for two years or so, in urging the institution of a special Scientific School for teaching the manufacture and management of gas; that we were discouraged and had abandoned the task. That, however, is "not our style."

The illustrations which, by personal favor of President Runkle to the Editor, we are enabled to-day to present, of the modes of teaching Metallurgy and the Working of Ores in that admirable establishment, the Massachusetts Institute of Technology, might furnish an appropriate text for further sermonizing on this topic.

The arguments that have been presented before, are just as strong now as then, and will lose no force with the lapse of time, but must gain continually thereby. A school so organized that young men ambitious of becoming Engineers, Superintendents, or Managers of Gas Works—by reason not of mere fortuitous circumstances, personal favor, nepotism and so on, but by the force of fitness in training and attainments, and combined practical and scientific knowledge—may be enabled to attain therein such training and such knowledge, by methods parallel to those set forth to-day as practised in the making of Metallurgists in the Boston Institution—such a school will mark a new epoch in the advancement of the great art of Artificial Illumination.

We have before pointed out that the demand for trained young men in this branch of practical science is quite large enough, that the interest of the public is sufficiently deep and universal, and that the amount of *capital* invested in the gas manufacture is enormous enough in amount—to justify the establishment of such a special school.

The subject will be reverted to again at an early day.

THAWING THE ERIE CANAL: GAS WELLS.

In the various investigations and discussions that arose during the winter last past—including that of Professor Thurston—out of the very novel proposition of Mr. Cheseborough, to keep the Erie Canal from freezing by means of artificial heat; one thing at least was made very manifest, namely, that if the thing could be accomplished, its mere money value would be something stupendous. Now our present object is to show that one suggestion elicited during this discussion, which attracted no attention whatever at the time, contains more pith than all the rest of it put together.

In a communication to the New York *Tribune*, dated Jan 27, 1874, Mr. Charles Plagge (whose acquaintance we cannot claim) let drop the following speculation in his closing sentence:

"It is very likely that in sinking artesian wells along the canal gas wells may be met with, which in this case could be most economically used for warming the water in the canal in winter."

As an illustration of the little chance that this acute and pregnant idea had of proper appreciation among the readers of the *Tribune*, it may be pointed out that the Editor in charge put to this paragraph the heading "Supplying warm water from Artesian wells," possibly not knowing, or forgetting, what a gas well is. Lucky is it that the proof reader did not delete the words "gas wells," which, curiously, would have still left an intelligible sentence.

Mr. Plagge has apparently not met with the Memoir read by the Editor upon Gas Wells, to the New York Society of Practical Engineering' November 15, 1871. (See this Journal for Dec. 2, 1871; pp. 162 to 164). The line of outcrop of the formation from which the West Bloomfield gas comes (shown there to be the Marcellus), lies far south of the line of the canal; but it was shown also in this same memoir that the gas found in boring at Buffalo comes from a stratum or strata lying far deeper, and cropping out many miles further north, than the Marcellus. The Salina group—or some one or more horizons included in it, are more than probably to be credited with the Buffalo gas. Now along the general line of the canal, the Salina will be found for great distances so situated as to be reached by borings not far therefrom, and at depths which will ensure its having retained its original gaseous contents unimpaired by outcrop-leakage.

Mr. Plagge, who is clearly but imperfectly acquainted with the geology of the matter, is as clearly, we should think, unimbued with a proper sense of the huge import of his own suggestion; and we would urge both himself and Mr. Cheseborough to follow up this vein with diligence. We shall render all assistance in our power.

OBFUSCATION.

This is a strong word; but the thing we apply it to, would justify a stronger one. In the *Scientific American* of March 28, in an article on Charcoal for Gunpowder, the following remarkable words occur:

"It is not a little singular that we possess (in Western Virginia) an extensive deposit of a carbonaceous mineral, which has been called grahamite, and has the same composition as gunpowder charcoal."

Our contemporary was certainly thinking of some other material than grahamite, which we conceive our many readers who have made gas from it for enrichment, would compare with almost anything sooner than with wood-charcoal. He says again that—"Being identical with the gunpowder charcoal in its chemical composition * * the principal powder mill in the U. S. is now making powder with this material." This latter fact, if it be a fact, is interesting and perfectly credible; but we maintain that there must have been some obfuscation in the mind of our neighbor on the point of identity of chemical composition. Will he not please recalculate his figures?

SULPHUR-COMPOUNDS IN COALS.

The form, or forms, of combination, in which sulphur exists in gas and other coals involve questions of importance, both scientific and practical. In the earlier days of gas-chemistry—and doubtless up to the present time, among many of the less advanced students of gas—it has been assumed, without sufficient consideration, that the sulphur of coal-gas is derived from pyrites or bisulphide of iron known to exist, even in form visible to the eye, in many gas-coals. The lack of consideration has been in the failure to take into account the fact that the temperature of evolution of the gas is barely high enough to expel sulphur from pyrites, in the absence of air. For some years, therefore, thinking men have been prepared to maintain the existence in most coals, if not in all, of resinoid carbonaceous compounds, containing sulphur in their constitution, such as exist in asafœtida, for example, and in similar resinoids. The subject is one of much scientific interest, and worthy of special laboratory study.

Sulphuretted Resinoids have been known for ten

years, Church having described in 1864 a brown Australian resin, *tasmanite*, containing 5·28 per cent. of sulphur. Sulphuretted coals, *without iron*, were also known to exist, even long before the valuable investigations of Wormley, of the Ohio Geological Survey. For example, for one from New Zealand, containing 2·5 p. c. sulphur and no iron, see Dana's Mineralogy, p. 757, No. 18 (quoted from Percy). The following item from a notice of a new Report upon the Geology of Missouri (from the *Engineering and Mining Journal*) conveys less therefore of absolute novelty than some might imagine:

"Mr. Regis Chauvenet submits a summary of the chemical work of the survey, performed by himself and Mr. A. A Blair, which consists of analyses of fuels, iron ores, and pig irons. An important feature is the experimental demonstration that sulphur exists in coals which contain no iron, or, in other words, that sulphur does not exist in coal in the form of pyrites only. Out of ten Missouri coals in which the sulphur and iron were determined, six were found to contain more sulphur than would be required to form bisulphide with the iron present. Three contained less sulphur than the formula would require; and one (the Baker coal from Lincoln County), contained over 2·6 per cent. of sulphur, and no iron at all.

IMPORTANT NOTICE.

SMEDBERG'S "SYNOPSIS OF BRITISH GAS-LIGHTING."

We take pleasure in announcing to the gas fraternity, and others interested in gas manufacture, that the above work is *now in the hands* of Messrs. John Wiley & Son of this city, for publication, and will be put to press with all possible despatch, as soon as an adequate number of subscribers is obtained.

In view of this, we would suggest to all who have not yet subscribed, to exhibit a just sense of the value and importance of a work of this kind (which will be the most complete and exhaustive volume ever published on gas, etc.), by sending in their names at once, as only a limited number of copies will be published at the subscription price ($15). After which the price will be, to non-subscribers, $20.

☞ PROFESSIONAL.—On this page appears a new professional announcement, that of B. E. Chollar, Esq., of St. Louis, who offers his services as a Consulting Gas-Engineer, This gentleman graduated some fifteen years since from the College of the City of New York, where his advantages for laying a scientific basis for practical training were unsurpassed. Choosing gas-engineering as his profession, he obtained such essential practical training subsequently at the Works of the Brooklyn Gas Light Company—to whose President, Mr. Benson, he refers—and has since then been constantly connected, in practical ways, with gas works. These antecedents, and this with the other highly respectable references Mr. Chollar is enabled to give, vouch for his ability and reliability. We feel fully justified therefore in directing to the professional card of Mr. Chollar the special attention of all concerned.

B. E. CHOLLAR,

Gas Engineer,

914 OLIVE STREET, ST. LOUIS, MO.

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OFFICE OF TROY GAS-LIGHT COMPANY, TROY, N. Y., March 24, 4874.

J. W. BARTLETT, Esq., 569 Broadway, N. Y.

Dear Sir: The city of Troy has adopted, almost exclusively, your "Boulevard Street Lamp." They have been in use here for two or three years, and have given general satisfaction. Our lamplighters prefer them to any other lamp ever used here, on account of easy cleaning and lighting. They are ornamental, strong, and diffuse the light splendidly, and I prefer them on the whole to any street lamp with which I am acquainted. Respectfully yours, F. A. SABBATON, Sup.

OFFICE OF GAS-LIGHT COMPANY, ROCHESTER, New York, March 25, 1874.

J. W. BARTLETT, Esq., 569 Broadway, N. Y.

Dear Sir: It affords me great pleasure to speak in most commendatory terms of your "Boulevard Street Lamp." Our city authorities are wisely substituting these for the old square lamp so long in use, and from personal and careful observation of their durability, the facility with which they can be cleaned, and their slight liability to damage as compared with the old form, I am inclined unhesitatingly to say that they are superior to any form of street lamp I have ever seen. The open bottom is not objectionable, but secures a much steadier flame than the ordinary square lamp which allows any breath of air to attack the flame on every side. With the globe of uniform thickness your lamp is nearly perfect. Yours very truly, GEO. W. PARSONS, Sup't.

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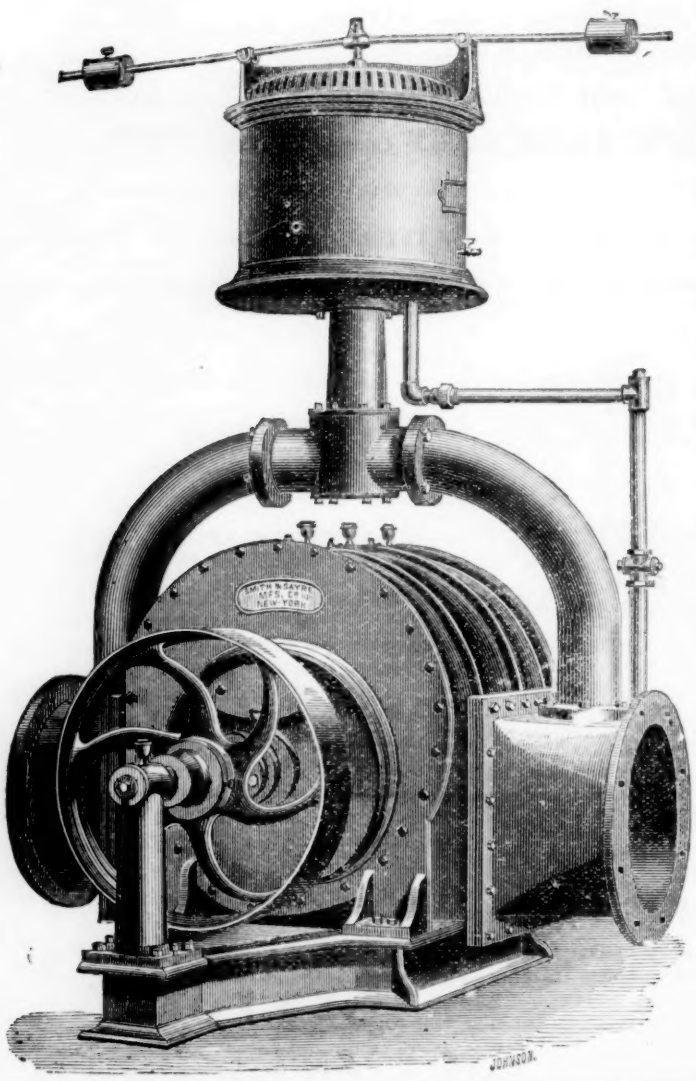

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E. DUFFEE, Esq., Agent, etc.

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EDWARD DUFFEE, Esq.

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Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3. 1870.

Mr. E. DUFFEE.

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EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
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Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

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H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
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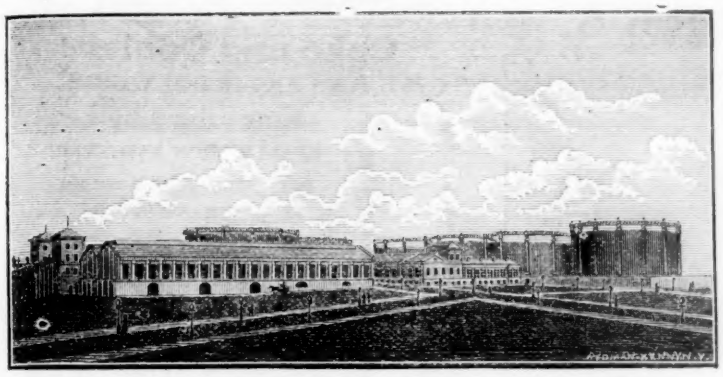

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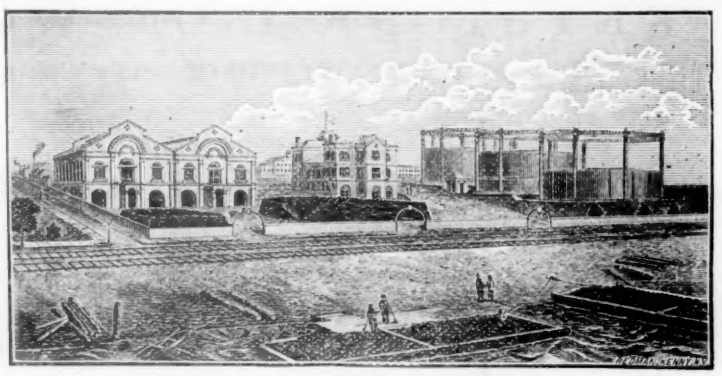

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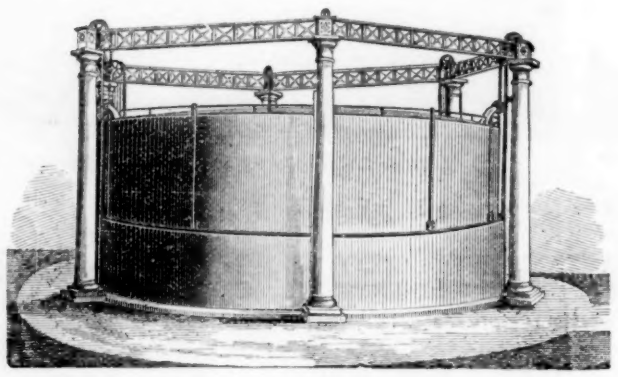

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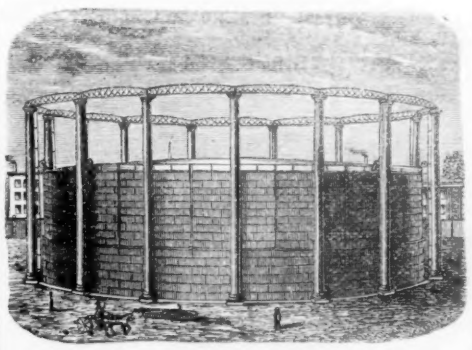

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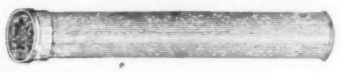

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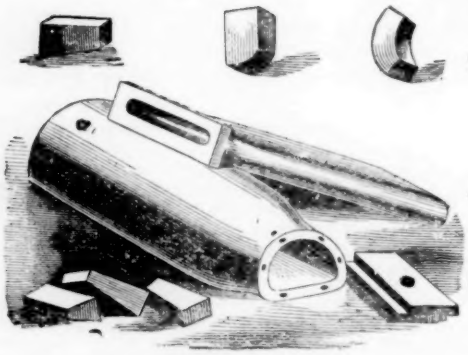

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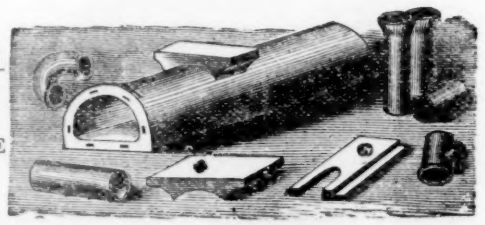

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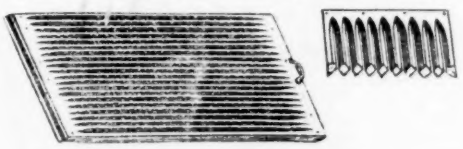

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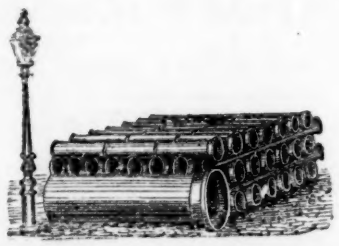

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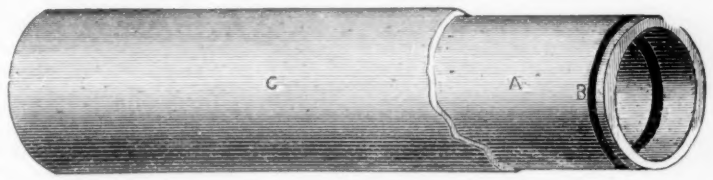

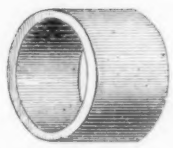

FIG. 2.

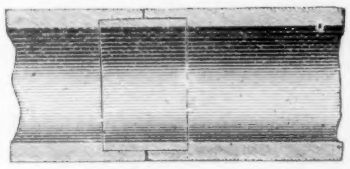

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cemen

FIG. 2.—Thimble for Connection. FIG. 3—Horizontal Section and Connection.

Above is a cut of the

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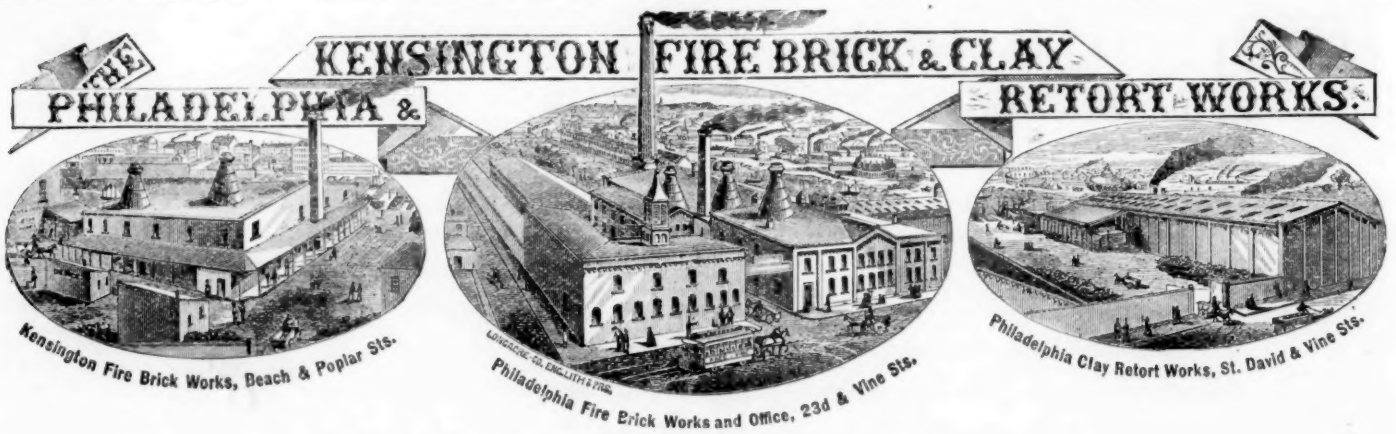
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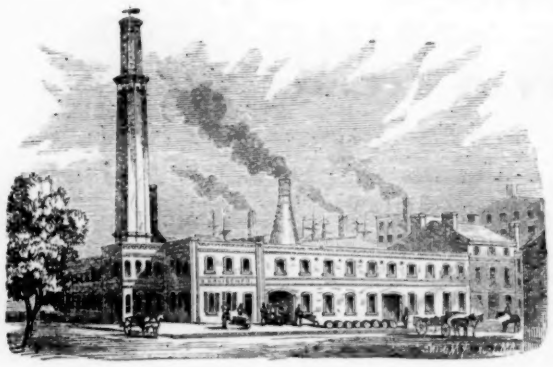

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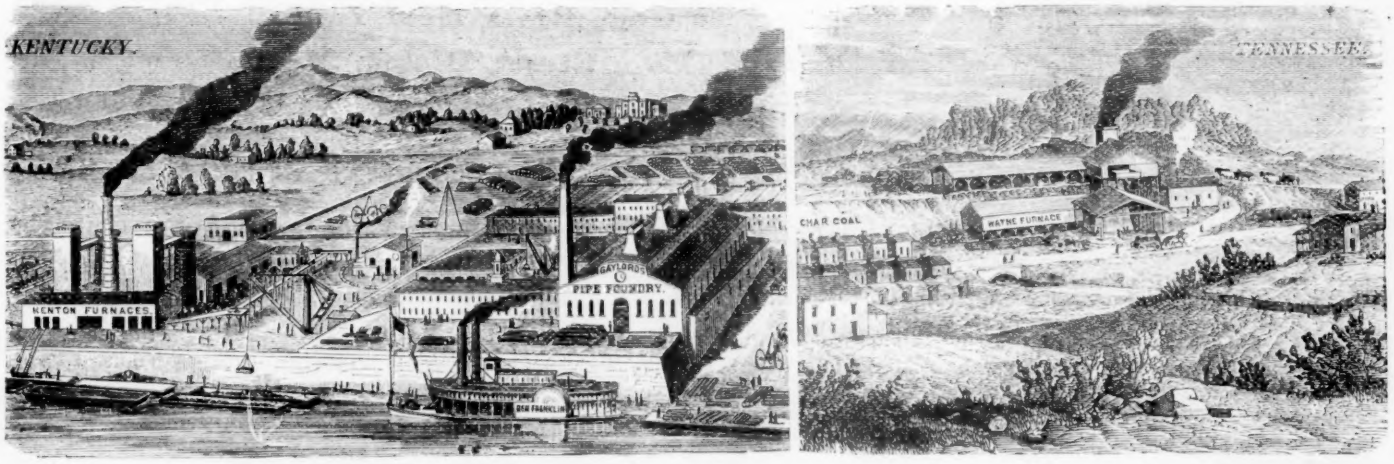

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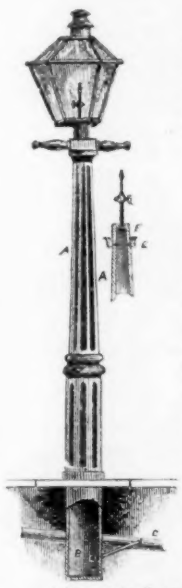

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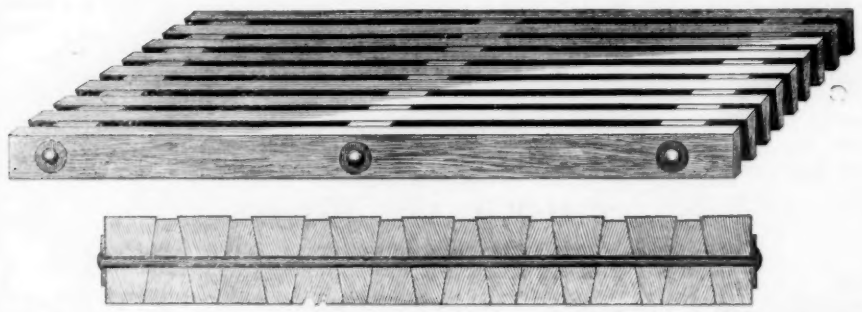

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